

Presentation Title: USGS Final Report
Incorporating into the SWMI Process

Date of Presentation: 17 January 2012

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This presentation is not to be cited as a reference. It's purpose is to foster open and broad discussion of the issues as well as help assure public awareness of the discussions as of the date of the presentation.

Incorporating USGS Final Report into the SWMI Process

Goals

- Summarize USGS Report
 - Less technical than WRC meeting (12 Jan 2012)
- Illustrate Prominent Differences Between Preliminary and Final
- Provide Detail on Proposed Changes to:
 - Biological Category
 - Flow Level

PART ONE -

USGS Final Report: Brief Review

Preliminary Study

- Use readily available variables
- Best Professional Judgment
- Illustrate a significant relationship between:
 - Human Alterations
 - Flow alteration
 - Impervious Cover
 - Basin Characteristics
 - Local channel slope
 - Drainage Area
 - Wetland Percent
 - Fish Community Metrics

Categorization

- Statewide Screening Tool
- Describe the Current Condition
- Using Best Available Science
- Living Document
- Useful Tool for Discussion of:
 - Streamflow Criteria



Prepared in cooperation with the
Massachusetts Department of Conservation and Recreation, the
Massachusetts Department of Environmental Protection, and the
Massachusetts Department of Fish and Game

Factors Influencing Riverine Fish Assemblages in Massachusetts



Scientific Investigations Report 2011-5193

U.S. Department of the Interior
U.S. Geological Survey

- Citation:
Armstrong, D.S., Richards, T.A., and Levin, S.B.,
2011, Factors influencing riverine fish
assemblages in Massachusetts:
U.S. Geological Survey Scientific Investigations
Report 2011-5193, 59 p.

- The report is posted on-line:
<http://pubs.usgs.gov/sir/2011/5193/>

- Printed copies of the report will be
available within about a month

Goals for Final Study

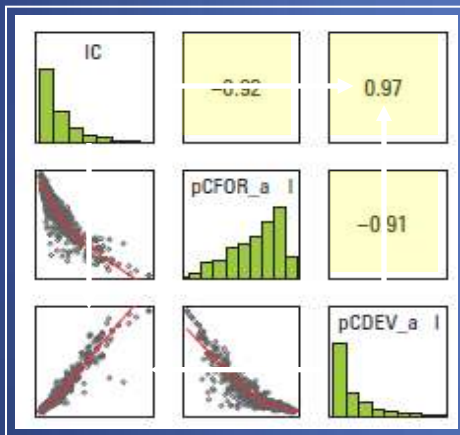
- Review more variables (total 150)
 - Land use data
 - Flow variables
 - Fish community variables
- Improve Analysis
 - Correlation
 - Variable Selection Process-PCA “strength”
 - Model Selection

Many variables are correlated

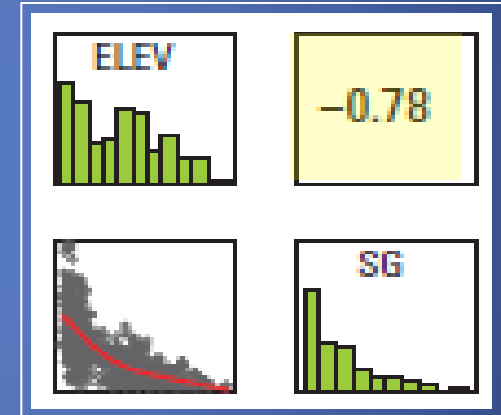
- Highly correlated variables cannot be used together in the same regression equation. Highly correlated variables ($\rho > 0.70$) were identified.

Examples

Percent IC, and Percent Developed Land Use (+)



Elevation, and Percent sand and gravel (-)



Other correlated variables:

Percent IC and Elevation (-)

Elevation and basin slope (+)

Percent IC and Percent alteration from August septic returns (+)

Percent alteration of August median flow and (June, July, September) (+)

15 Variables (of 150 potential variables) were retained to use as candidate variables for regression models

Natural basin characteristics

1. Drainage area
2. Channel slope
3. Percent sand and gravel

Land-cover/Land-use variables

1. Percent forest
2. Percent wetland in buffer
3. Percent impervious cover
4. Percent agriculture in buffer

Flow alteration metrics

1. Percent alteration of August median flow from groundwater withdrawals
2. Percent alteration of August median flow from surface-water returns
3. Percent alteration of mean annual flow from surface-water withdrawals
4. Percent alteration of mean annual flow for net depleted sites

Dam/impoundment metrics

1. Dam density
2. Percent open water in the contributing area.
3. Length of undammed stream reach in network
4. Length of undammed stream reach upstream of the sample site along centerline,

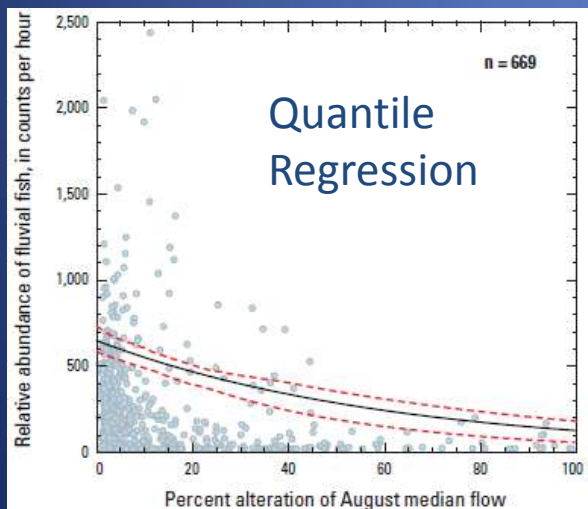
Two analysis methods were used to associate fish assemblages and environmental factors

1. Quantile regression
2. Generalized linear models (GLMs)

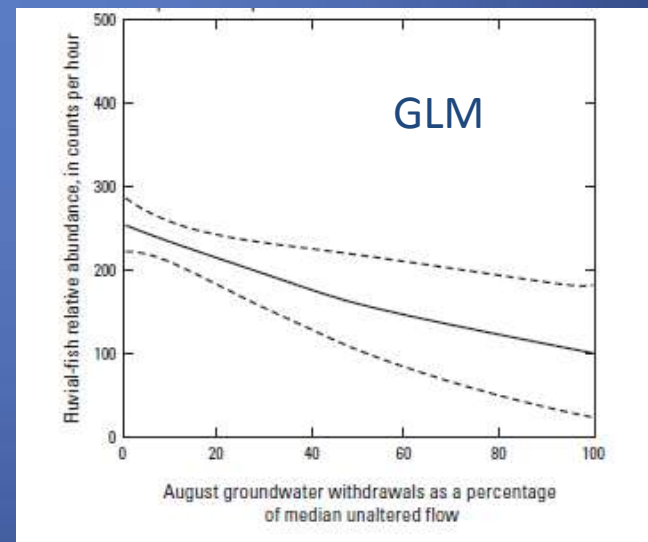
Fluvial-fish relative-abundance model (with IC)

$$E(Y) = e^{6.1523 - 0.0840 CHSLP - 0.0091 AUGgwWp - 0.0289 pBWet - 0.0373 IC}$$

Quantile regression is univariate



GLMs are multivariate



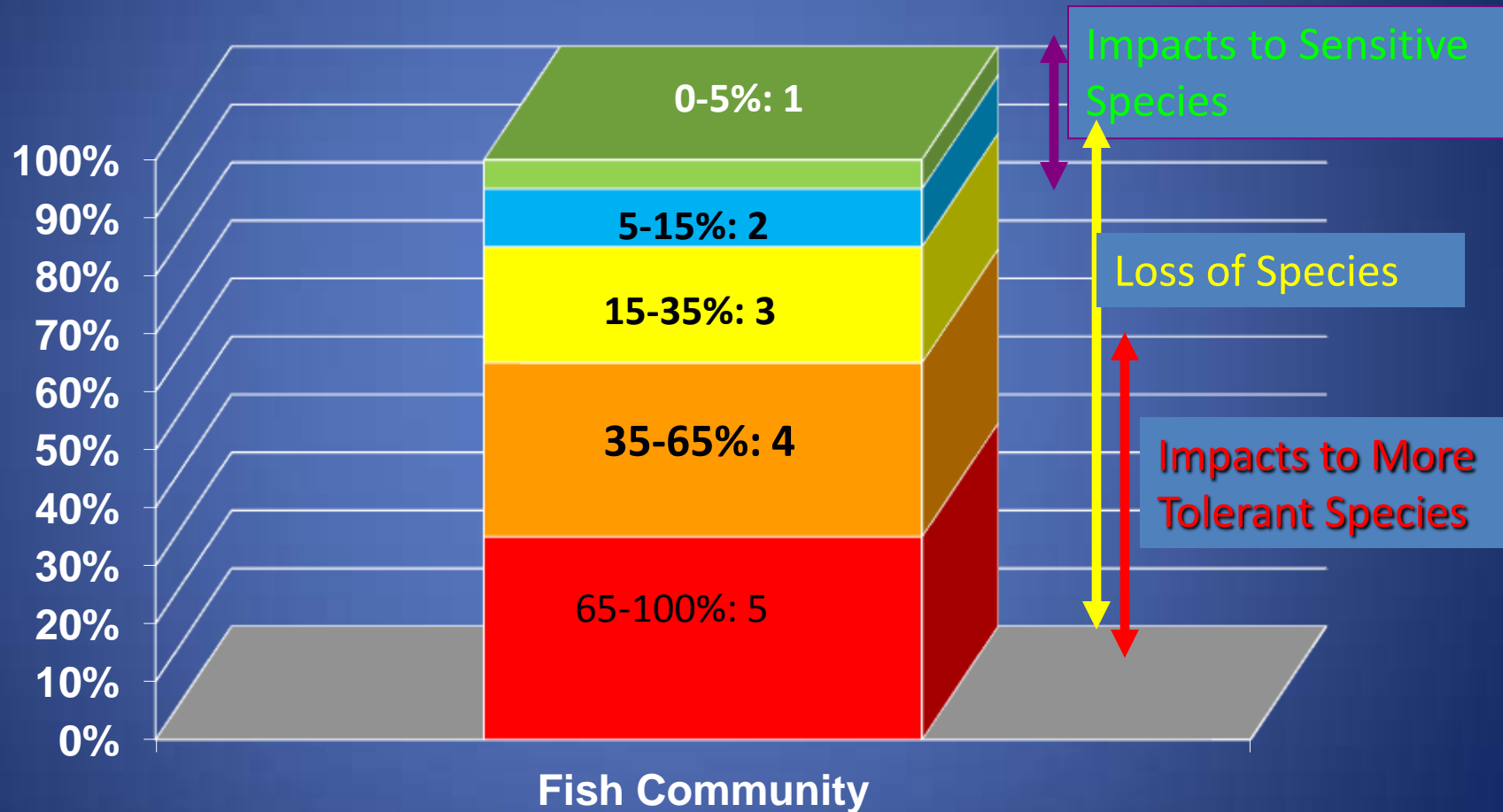
Final Study

- Regression Equation
 - Channel Slope
 - Buffer Wetland
 - Impervious
 - Percent Alteration of August Median from Groundwater Withdrawal

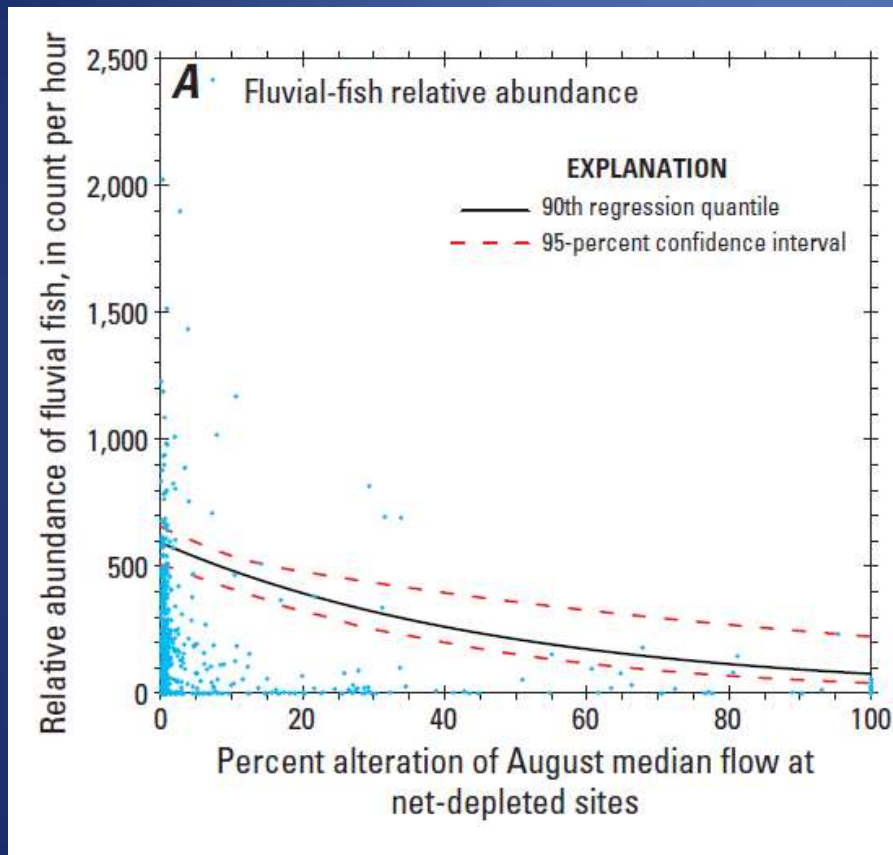
PART TWO -

Incorporation of USGS Final Report
into SWMI

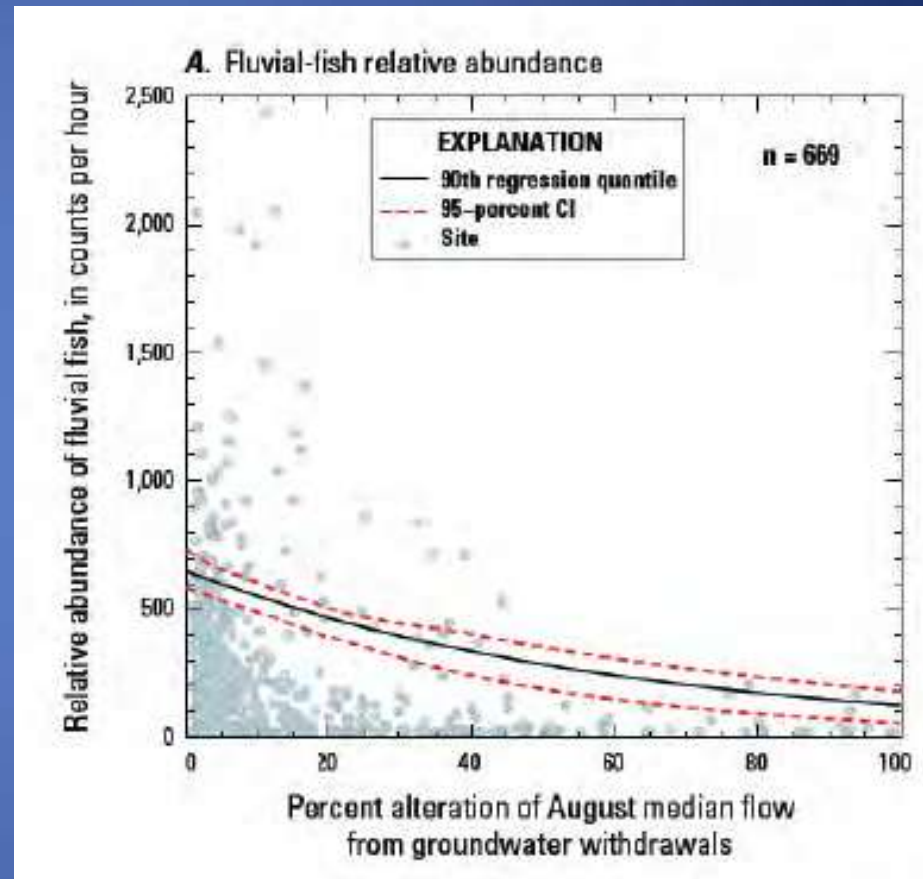
Fish Community Response



Preliminary report



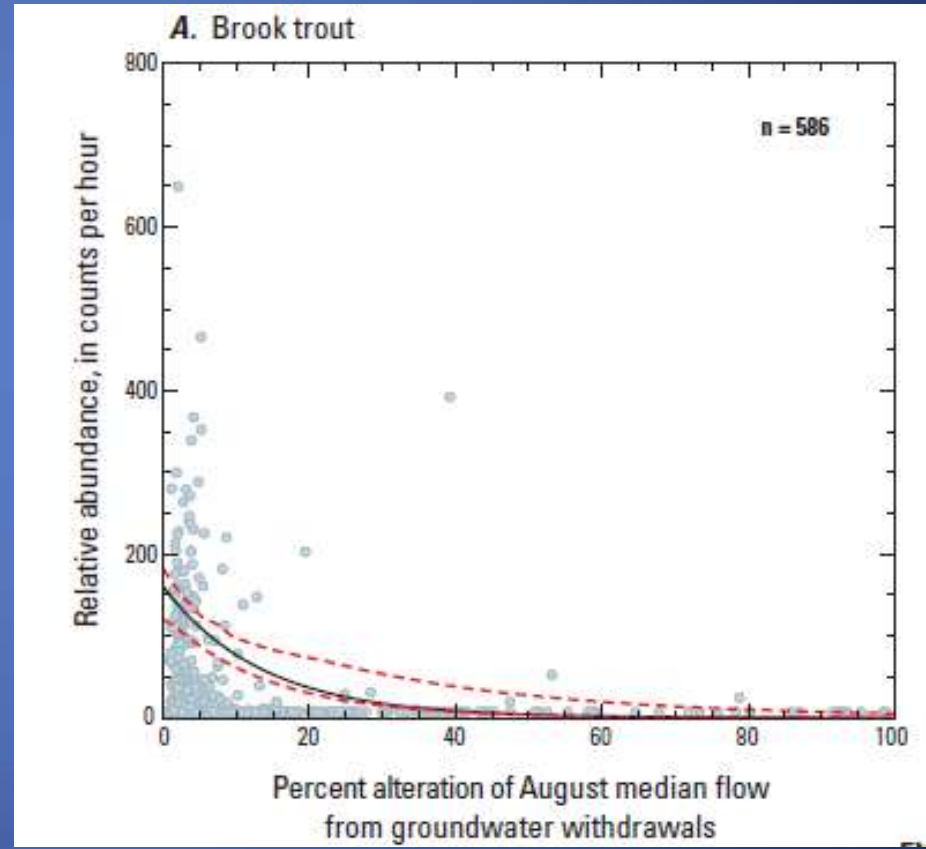
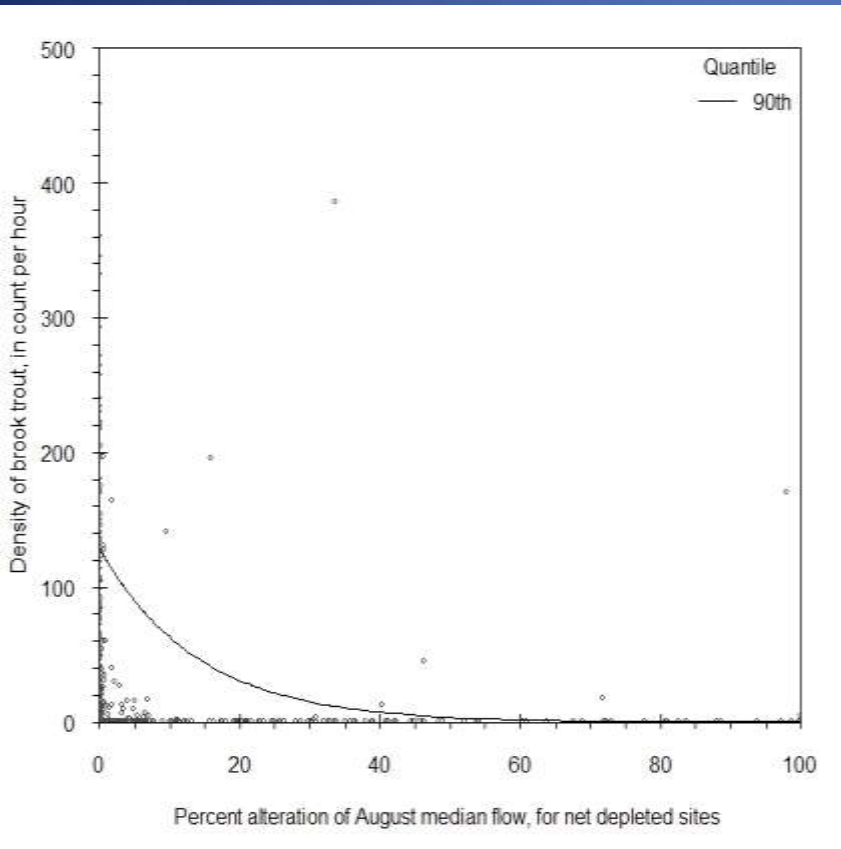
Final report



Brook Trout Quantile Regression

Preliminary Report

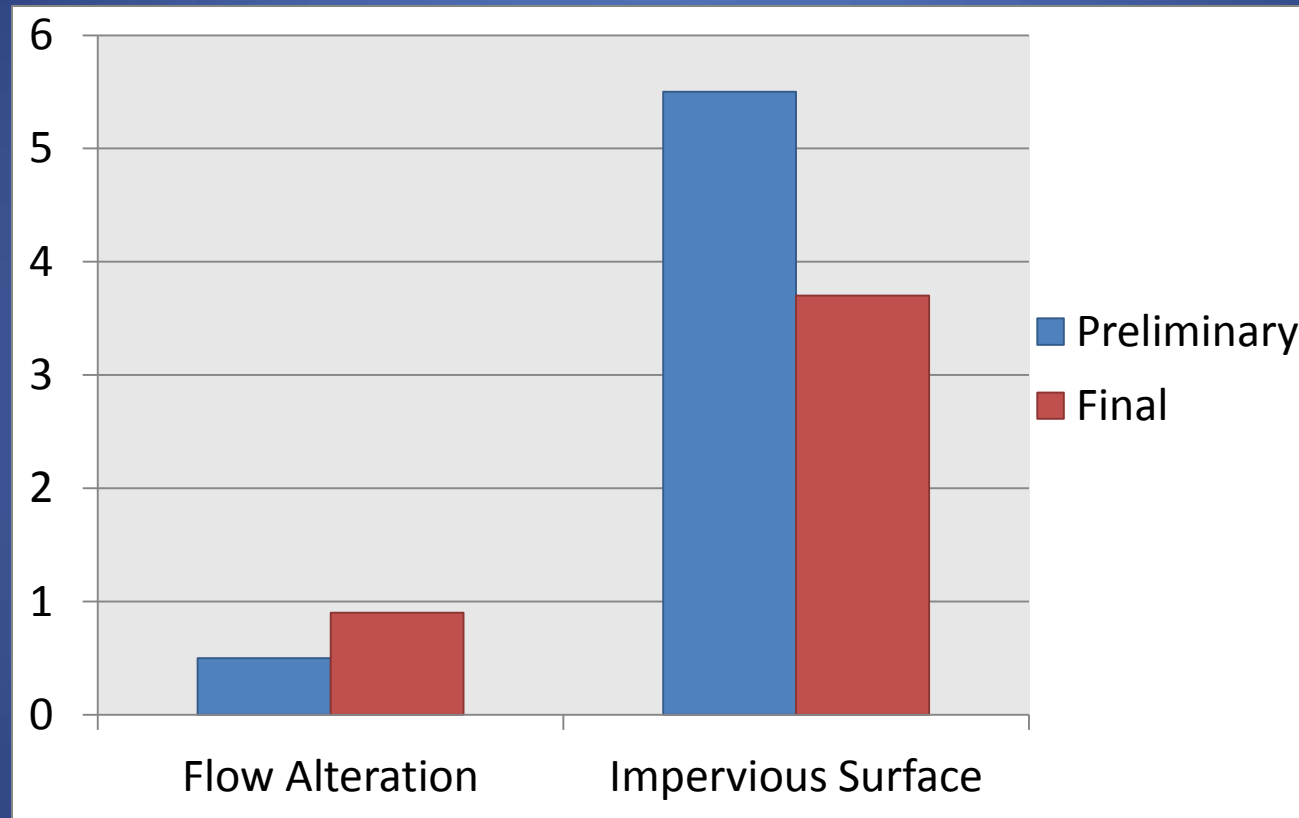
Final Report



Regression Equation Interpretation

- Preliminary Study
 - 1% change in flow alteration = 0.5% change in Fluvial Fish Relative Abundance
 - 1% change impervious cover = 5.5 % change in FFRA
- Final Study
 - 1% change in flow alteration = 0.9% change in FFRA
 - -1% change in impervious cover = 3.7% change in FFRA

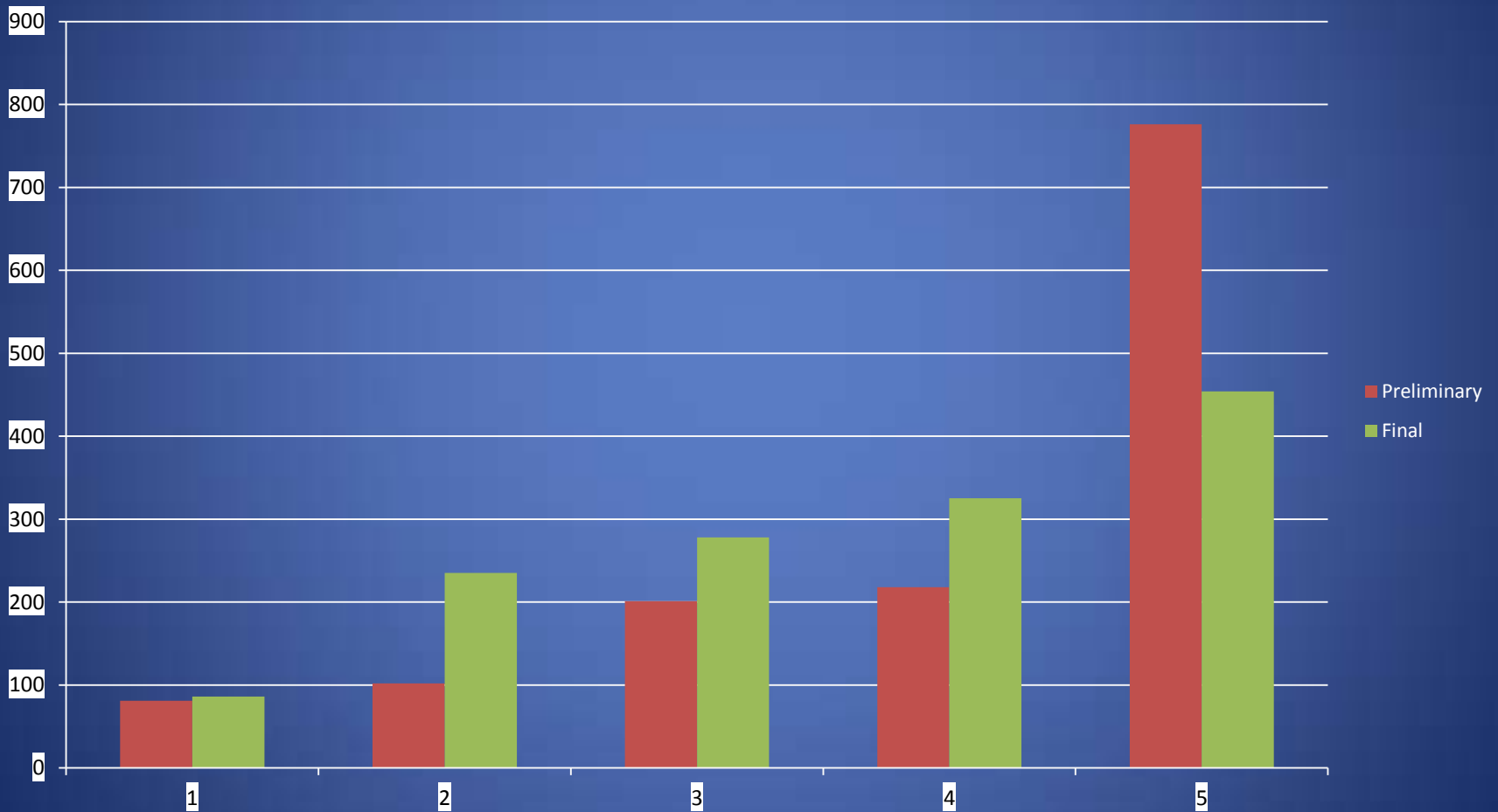
Regression Equation Interpretation



Stream Flow Criteria

Flow Level	1	2	3	4	5
Preliminary	5	15	35	65	>65
Final	3	10	25	55	>55

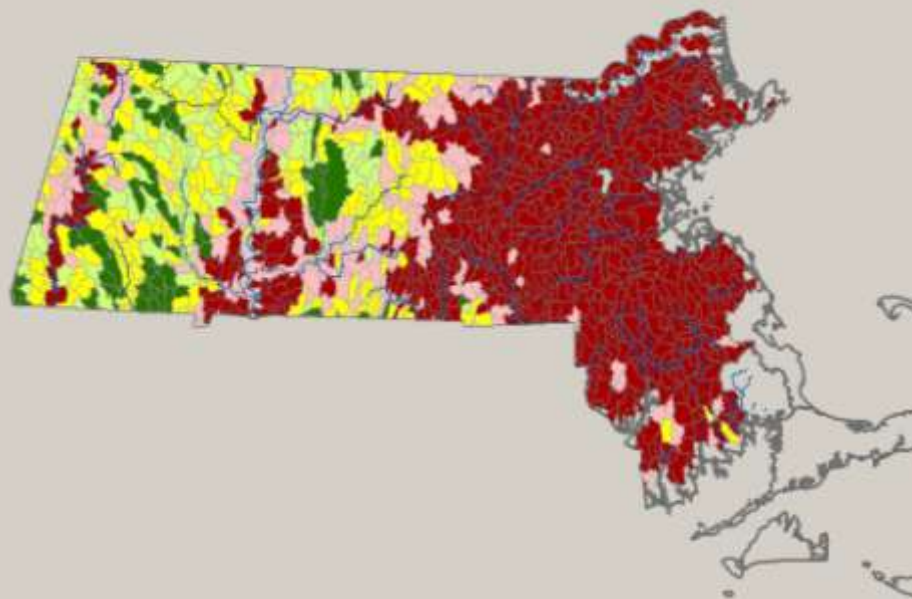
Biological Category



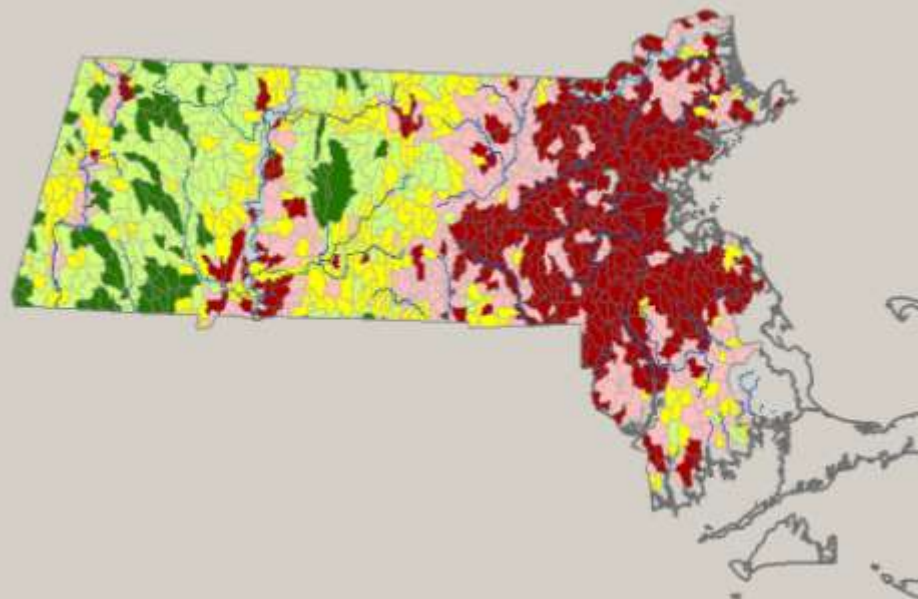
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Biological Category Comparison

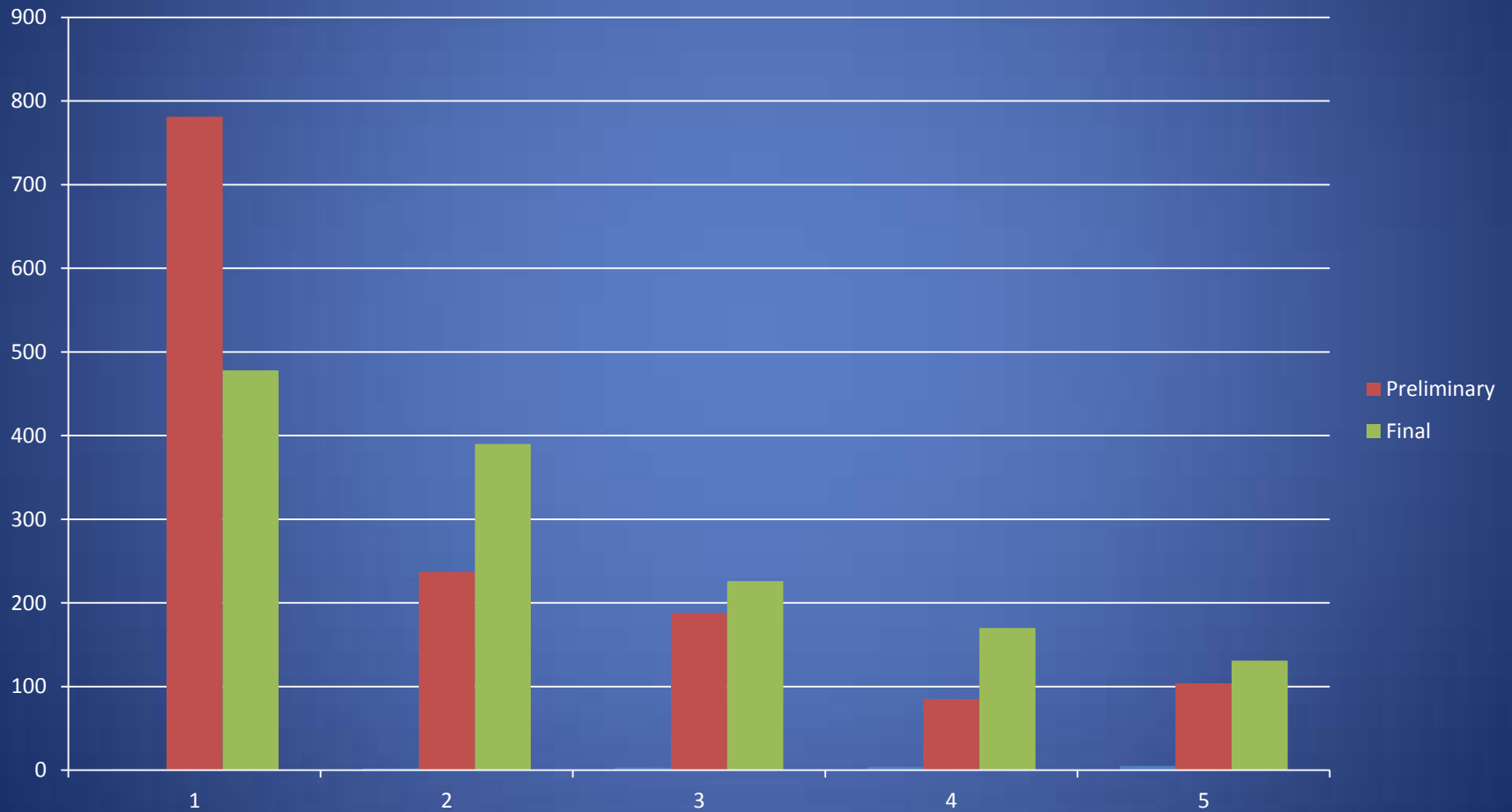
Preliminary



Final



Flow Levels

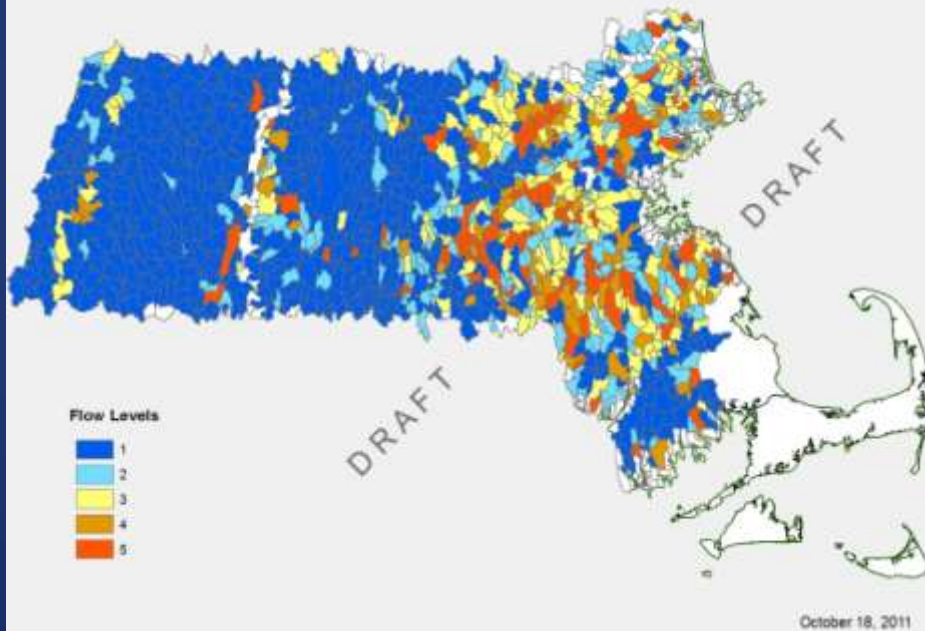


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Flow Level Comparison

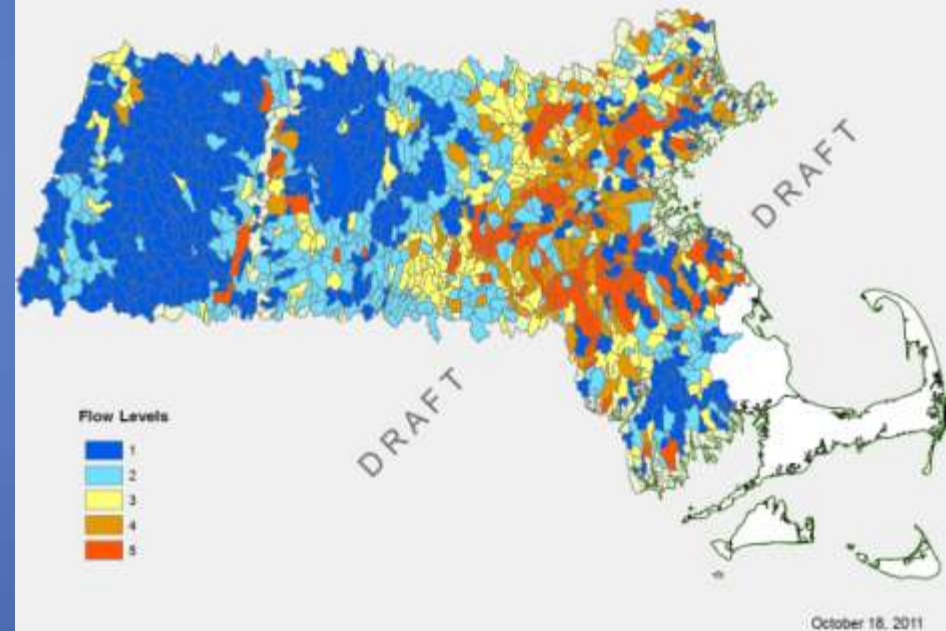
Preliminary

Flow Levels Using Preliminary USGS Results



Final

Flow Levels Using the Final USGS Results



Categorization

- Statewide Screening Tool
- Describe the Current Condition
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